Comments on Future STAR Physics and Upgrades

Initial STAR 5 year physics program now a 10 year program

(37 week per year program ® allocated 20 weeks per year)

What do we want to do physics-wise by 2010 ® this is not really RHIC II yet !

Soft physics program - strangeness, HBT & particle correlations, fluctuations,

v_2 (f, X, W,..), correlations with event ensemble selection (EbyE), exotica

Spin physics program (2004 - 10) - DG(x) from jets, di-jets, g-jet; PV from W^+ & W^- , more

Gluon structure functions and shadowing - g - jet in pp, pA

Jet quenching in AA (pA) - inclusive high p_T hadrons (15 GeV) and jets (30 GeV),

g - jet, g - leading hadron, di-hadrons, di-jets,

heavy (b) vs. light (u,d,s) quark jets (flavor composition vs quenching),

electron + leading hadron from displaced vertex

Initial state (k_T) and final state effects in cold nuclear matter - jets from pA

Charm and bottom production - open charm (D-mesons), B and D displaced vertices

Onium suppression in AA, propagation in pA - e+e- from J/Y, Y', U

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What must we do to accomplish the physics in the next 5 - 10 years?

1) Acknowledged and supported "advanced tracking team"

TPC, new detectors, tracking developments, changing environment

2) DAQ/Trigger upgrade/overhaul

3) Implement a micro-vertex detector as soon as possible (2005?), then upgrade later

® displaced vertices critical for heavy-quark jet probes, open charm

Need to form a detector project team now!

4) Forward Pi-Zero Detector

® spin physics, nuclear shadowing

5) ToF Barrel

® Kaon ID for D's, PID for resonances from combinatorial techniques, EbyE,...

6) EMC segmentation upgrade

® electrons (J/Y, Y', U , $W^{\pm}$, Z), leading hadron triggers (p^0, hs),

direct g , g -jet, g -hadron

7) Forward direction (silicon, PID, other??)

® pA, di-hadrons, low x physics

Magnet (not mentioned?)

- RHIC cooling for warm sections

® reduce beam-gas and associated TPC distortions

- question - 30 - 40 GeV electrons for spin physics program???

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Seems - our problems are associated with "*worries about*" 40 x L_o, *not physics!*

So what do we want to do for physics in > 2010 [- or - this is RHIC II]

Cannot be done with previous STAR upgrades and 4x L_o? ® requires 40 x L_o?

- gg HBT ® best with new TPC /converter
- direct g ® separate experiment?
- single particle inclusives to high p_T (fragmentation function)
  - and gluon vs quark jets from ` p/p, K-/K+
  - ® leave to PHENIX?
- certain B, D decay modes (e.g. B^o ® J/y K^o_s)
  - and low/intermediate p_T spectra (e.g. B ® D* and D* or D ® Kp or Kpp)
- v_2 (D, B, J/y) - suppression/co-movers
- gg and backscatteredg-jet
  - (high density gluon back-scattered from scattered parton)
- other back-to-back correlations ® *all for discussion!*

Requires:

- High luminosity tracking detector for 20 - 40 GeV/c particles - present TPC???
  - ® compact tracking detector + pad chambers -or- alternative?
- PID to ³ 10 GeV/c - additional detector(s)?? ® Cherenkov (threshold/RICH) detectors
- Momentum resolution / magnet field strength increase ® *all for discussion!*